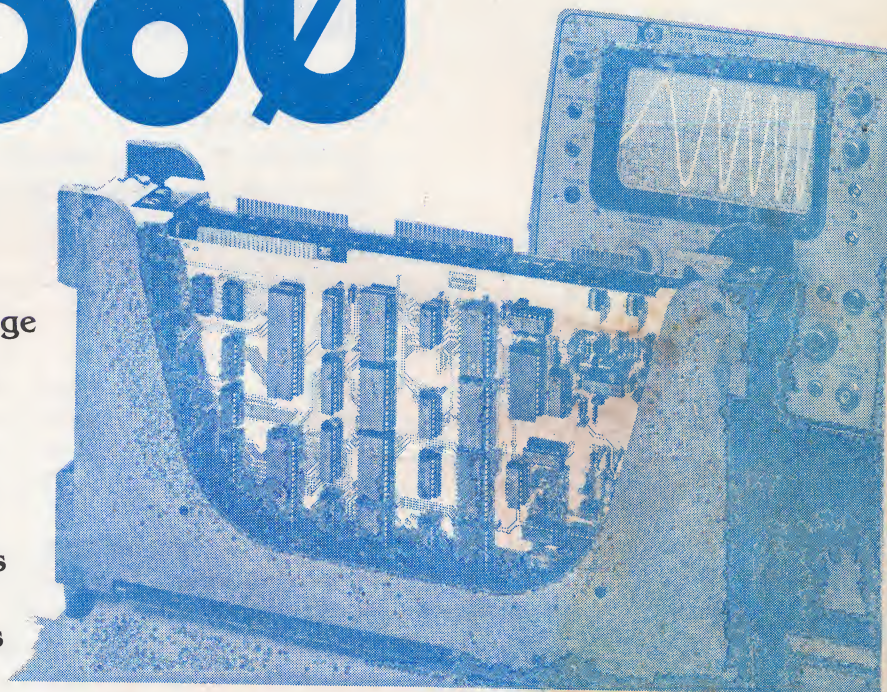


data sheet: **pro80**TM

Mar 80

- 10 Hz to 2 MHz Range
- .0025Hz resolution
- MULTIBUS[®] compatible
- phase-continuous FSK, MSK, & FM
- PSK & QPSK Signals
- frequency/phase changes in < 300ns



Microprocessor Compatible **Frequency Synthesizer**

GENERAL DESCRIPTION

The PRO80 Frequency Synthesizer covers the range from 10Hz to 2MHz with 0.002Hz resolution. This single-card unit is mechanically and electronically compatible with SBC-80 microcomputers produced by Intel Corp., BLC80 microcomputers produced by National Semiconductor and MSC8001 microcomputers produced by Monolithic Systems, and any other MULTIBUS[®] compatible equipment. The synthesizer is controlled by transmitting frequency command data from a microcomputer to the synthesizer through the standard MULTIBUS interface.

Frequency changes are phase-continuous and occur less than 300 nanoseconds after a LOAD command is communicated across the bus to the synthesizer. The PRO80 includes an on-board frequency standard with 100 ppm stability. The standard may be locked to an external reference at 1, 2, 5 or 10MHz if desired. In addition, a 10MHz reference output is provided so that the reference may be daisy-chained through a number of PRO80 Synthesizers.

APPLICATIONS

- **Frequency Measurement and Control**
The synthesizer is conveniently applied to a wide variety of communication, control and production test systems. Since frequency transitions are phase continuous, the PRO80 can be used as the digital equivalent of a voltage controlled oscillator in a phase-locked or frequency-locked loop. A digital loop

filter is easily implemented in software in the associated microprocessor. In this way, extremely narrow bandwidth loops can be realized. Moreover, the frequency commands can be averaged to digitally derive a high accuracy estimate of the frequency being tracked.

- **Communications and Tracking Systems**

Several commonly used communication and tracking waveforms are readily produced by the PRO80. These include phase-continuous FSK, MSK, and linear frequency modulation. A special feature incorporated into the PRO80 design allows the synthesizer output to be phase-modulated in steps of 180° or ±90° under microprocessor control. Thus, the PRO80 can also create PSK and QPSK signals.

- **System Simulation**

The maximum frequency update rate is limited by microprocessor speed. Assuming an SBC-80/10 microcomputer with a 480 nanosecond clock period, the minimum time required to increment the output frequency is 24 μsec per increment. Rapid frequency slewing with extremely fine granularity can be achieved with the PRO80.

- **Automated Test Equipment**

The units have application in process control, production test, and instrumentation. Up to 30 PRO80 Synthesizers can be uniquely addressed from a single microprocessor. Precision phase shifts can be implemented at any synthesized frequency under program control by the host microcomputer.

Synthesizer drive software routine for SBC 80/10 and a synthesizer demonstration/test routine provided with each unit.

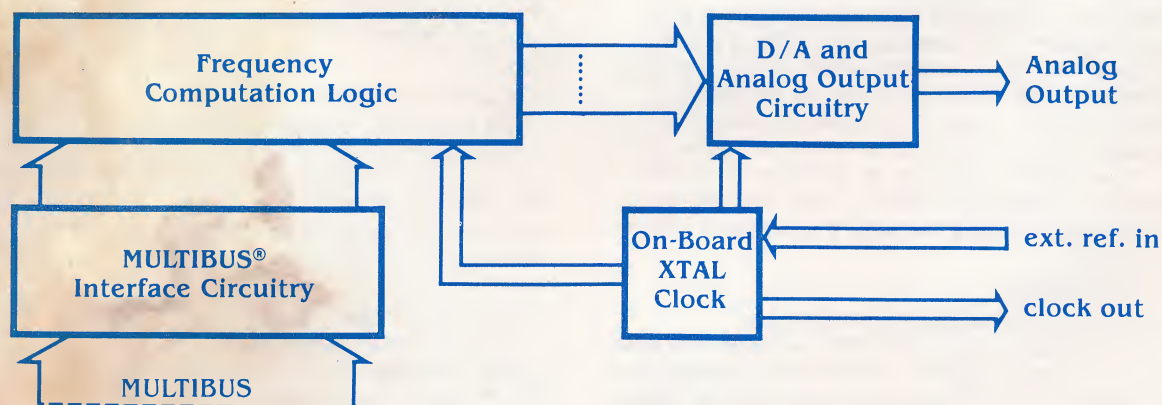
MULTIBUS[®] is a trademark of Intel Corp.

performance specifications: **pro80**TM

Frequency Range:	10Hz to 2MHz
Step Size:	0.0023Hz ($10^7/2^{32}$ Hz, exactly)
Power Output:	10V P-P into an open circuit, ± 1 dB 5V P-P into 50Ω
Output Waveform:	Sine wave
Harmonics:	40dB below output 10Hz $\rightarrow$.6MHz 34dB below output .6MHz $\rightarrow$ 2MHz
Non-Harmonic Spurious Outputs:	46dB below output worst case
Phase Noise:	-50dB in 30kHz excluding 1Hz about the carrier
Frequency Stability:	100 ppm, on internal reference. Unit may be phase-locked to an external reference at any subharmonic of 10MHz.
Frequency Switching Transients:	Switching is phase continuous, transient is less than 300 nanoseconds.
Frequency Selection:	Frequency command from a MULTIBUS [®] compatible microcomputer, 30 bits binary.
Other Command Modes:	LOAD, CLEAR, Phase Step 90°, 180°, or 270°.
Typical Frequency Command Set-up Time:	Maximum of 60 μ sec for an SBC-80 and 0.48 μ sec clock period. (Depends on number of bits changed.)
Auxiliary I/O:	14 Programmable I/O bits on a separate top edge connector.
Bus Addressing:	Uses 8 consecutive addresses, 30 unique system addresses available with SBC 80/10.
Auxiliary Squarewave:	Buffered TTL, 100ns 0 crossing jitter.
Power Requirements:	+5V at 2A (max.) +12V at 100mA -12V at 50mA Supplied via bus connector
Dimensions:	Compatible with SBC/MDS/BLC card format, i.e., system consists of a single printed circuit card 12" $\times$ 6.75" O.D. pin-for-pin compatible with MULTIBUS connector.*

*See MULTIBUS definition in Intel "MULTIBUS Interfacing", AP-28, available from Intel.

PRO80 System Block Diagram



Proteon's 180-day warrantee includes a card-swapping service which minimizes down time. All units are burned in for 100 hours at 50°C before shipment.

proteon associates, inc. 24 crescent st., waltham, ma 02154 617-894-1980

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Gentlemen:

You recently requested information concerning the PR080 Frequency Synthesizer. The PR080 Frequency Synthesizer has generated a high level of interest because it is directly microprocessor-compatible, provides phase-continuous frequency shifting, and very high resolution. The PR080 is now being used in:

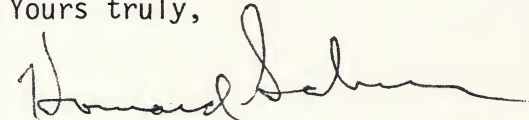
- * Automatic Test Equipment
 - Rapid test of frequency responses
 - Direct microprocessor control
- * Communications System Simulation
 - Continuous phase feature used in simulation of variable Doppler shift
- * Radar and Communication Waveform Generation
 - Chirp and PN
 - Built-in 0°, 90°, 180°, 270° phase shift keying
- * Precision Frequency Standard Verniers
 - Resolution is 0.0023 Hz
 - 1 μ Hz under program control

The PR080 Synthesizer is designed to be built into microcomputer equipment which employs the MULTIBUS interconnection architecture. With more than 35 manufacturers producing microcomputers, add-on memories, I/Os, data acquisition units and other subsystems compatible with the INTEL MULTIBUS - rapidly becoming a standard - the PR080 Synthesizer is well-designed for use in these systems.

The attached specification sheet describes the PR080 Frequency Synthesizer in some detail. Note that due to our own conservative ratings and thanks to good customer feedback, we have improved some performance specifications; notably, the worst-case spurious response is reduced from -46 dBc to -50 dBc.

The PR080 still costs \$1300 for 1 to 9 units, and \$1175 for more than 10 units. We welcome your comments and are ready to discuss your requirements and the performance you can expect from the PR080.

Yours truly,



Howard Salwen
President

enc.: PR080 Data Sheet

HS/baa